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A NATIONAL LABORATORY OF HUMAN NUTRITION[1]

THE Inter-Allied Scientific Food Commission, which held meetings during the spring and early summer of 1918 in Paris, Rome and London, decided to recommend to the four governments represented, those of France, Italy, England and the United States, that a laboratory for the study of human nutrition be established in each of those countries. The commission called attention to the fact that at least one quarter of the income of a nation is devoted to the purchase of food by its individual citizens and that, since the poorer the individual the greater is the proportion of his wage devoted to the purchase of food, it is therefore a matter of the highest importance for the welfare and prosperity of a country that the methods of the best possible utilization of its food resources for the benefit of its citizens be sought out and in time definitely established by reliable scientific data.

The comforts which one enjoys in the modern world are derived from the advance of science. Though the so-called "practical man" says he will accept no "theories," yet in reality he never acts except upon some theory of his own. The difference in the value of the opinions of the "practical man" and the "scientific man" is that the theories of the latter are more likely to be correct than those of the former.

If one looks back into history one notes the influence which an American-born scientist, Count Rumford, had upon the fortunes of Bavaria. Among the 60,000 inhabitants residing in Munich there were so many beggars and vagabonds, who were all potential thieves, that in the year 1790 Rumford authorized the seizure of 2,600 in one week and put them to

[1] A paper prepared in London in June, 1918, at the request of Professor Langlois for publication in France.

work under well-ordered and kindly direction. He also provided a soup kitchen which could feed a thousand or more people, and he prided himself that it cost only half a franc to pay for the fuel to cook for a thousand persons. He endeavored to introduce the use of maize meal into Bavaria and gave exact directions as to its cooking. He employed soldiers, who had acquired habits of indolence, upon public works. He arranged little gardens for the military, in which they cultivated potatoes, and through his improvements in the processes of cooking, by means of better boilers which consumed less fuel, he endeavored to make the soldiers much more comfortable than they had ever been before and at much less cost. He sought to improve the live stock of the country by proper breeding. He believed that science was at the foundation of all reformatory enterprise and in his own words sought "the providing of the wants of the poor and securing their happiness and comfort by the introduction of order and industry among them." And his results were successful because his theories were sound.

One can trace the life of this Bavarian community yet further, for in 1822 Liebig resided in Paris and met there the pupils of the great French scientist, the immortal Lavoisier. Liebig took back with him the fundamental truths discovered by this great Frenchman and later the town of Munich built the first great chemical laboratory, a laboratory destined to become the one in which his successor enriched the world by the discovery of artificial alizarine.

Lavoisier was the first to establish the modern truths concerning the nutrition of man and stated "La vie est une fonction chimique." He called attention to the fact that his experiments showed that the poor laboring man needed more food than the rich man who did no work, and yet that the laborer was much the less likely of the two to get sufficient food.

The provision of man with adequate food is a social obligation of the highest importance. In the middle of the eighteenth century Benjamin Franklin noted that where there was famine there was disorder, and that where there was disorder famine followed in its train. This, indeed, we now believe to be the sum and substance of the recent Russian revolution. After the Napoleonic wars famine devastated portions of Europe. In Magendie's "Journal de physiologie"[2] there is an account of famine which occurred in six provinces of France during the winter of 1817, the second following the Congress of Vienna, a time of great distress in Europe. A dropsy of a peculiar kind developed. Curiously enough, just one hundred years later, in January, 1917, a malady called "war edema," broke out in Germany and Austria, especially among prisoners of war. The cause of the disease was attributed to lack of nourishment, especially to lack of fat in the diet, for after giving 100 grams of fat daily for a week to each of three different patients a complete cure was effected without resort to any other remedy.

A national laboratory of human nutrition would have many unsolved questions to answer and perhaps a few of these questions might be suggested in this article.

There should be researches into the requirements of food necessary to maintain health, strength and work in men, women and children engaged in various occupations. It is well known that a man who is over the average weight is an inefficient laborer, but it is not certain whether a man who is reduced in weight and receives good food is as efficient as when he is of average weight. He might easily be just as effective and possibly more effective a worker when thin than when of average weight.

Another important question is whether the ration of about 500 grams of meat per day which has existed for over a hundred years in the American and English armies is not altogether too high for production of the maximum of physical work which can be accomplished by a soldier. It may well be that such a diet of meat may tend to mental relaxation and to a sensation of difficulty in the performance of a task, such as has been actually ob-

[2] Gaspard, B., "Effets des alimens végétaux herbacés," *Journal de physiologie*, 1821, I., 237.

served in laboratory experiments upon men who have taken large quantities of meat.

Furthermore, it would be interesting to know how much milk is required every day for children of various ages. It is not known to-day how much milk must be taken to prevent rickets developing in children.

It is also unknown how much food a child should be given at different ages, or whether a boy needs more additional food in order to do a certain amount of work than his father would need to accomplish the same amount of work. It may be that the growing muscles of a boy are not as efficient machines as those of an adult.

Then there is a vast field in the study of the psychology of food. The Jews are told as children that pork is unfit for food and they rarely conquer their repugnance to it. The English are told as children that maize is food for pigs, and though Americans eat maize bread with pleasure and have recently done so to a huge extent in order to make possible exports of wheat to Europe, the English persist in their unfounded prejudice against it. I once had a diabetic patient who was one of my own students and he had heard me say in my lectures that the sugar levulose was the only sugar that could be used by the body in that disease. When 100 grams of levulose were given to him he was apparently greatly benefited. His strength improved, as measured with an ergograph, and all his classmates remarked upon the wonderful change in his spirits. Alas, none of the sugar was used in his body and all the apparent benefit was derived from mental suggestion. In this little story lies the essence of much sincere self deception, as well as the foundation of dangerous frauds, such as are exploited by makers of patent medicines. It is also evident that the testimony to the effect that 500 grams of meat are desirable for a soldier may rest on an extremely shaky foundation.

A laboratory of human nutrition should have at its disposal a close statistical analysis of the available food supply of the country and should be able to advise the government so that a sufficient quantity of suitable food may be always available. Thus, chemical analysis of the food products, which would show approximately the quantity of food materials obtainable from any given source, such as maize or hogs or cattle, should each year be determined.

There should also be an investigation into the food resources of the country so that they may be used in the best interests of human beings. For example, it is wrong to feed bread grains to pigs when human beings need them more.

If these four laboratories, British, French, Italian and American, be established, the directors should meet together annually and discuss results. And it would be wise to arrange for the exchange of trained assistants.

It may be said that to build a nutrition laboratory would be too costly for the state. In this connection it should be remembered that in Germany for the past eighty years, even in times of her greatest poverty, money has always been spent for laboratories accompanied by recognition of her scientific men, and these things made her rich and powerful more rapidly than culture lessened her inherent barbarism. Before gold was discovered in Alaska and in South Africa, I heard a professor of geology in New York say that the geological formation in these two sections was such that gold probably existed there. Other people got the gold that the scientist knew about. Take another illustration. Biffen, of Cambridge, England, developed a new brand of wheat called "Little Joss." In 1913 this brand of wheat was sown and it produced four bushels per acre more wheat than any other variety. The gain to the farmers that one year alone amounted to $1,000,000, while the laboratory in which the work was done cost $200,000 to build. It is probable that the work of a nutrition laboratory especially designed for investigations into the food requirements of man could be carried on at an expense of less than one hundredth part of one per cent. of the cost of the food supply of each of the Allied Nations, and if the director of such a laboratory were a man of broad vision and creative imagination, the laboratory would be certain to add to the knowledge of the

world, to the welfare of the community and to the dignity and honor of the nation.

Graham Lusk

Cornell Medical College,
New York City

THE IRWIN EXPEDITION[1]

The Irwin Expedition of Indiana University organized in cooperation with the University of Illinois which started in June, 1918, to study the fresh-water fishes of Peru and Chile and of the Titicaca basin, has returned, bringing very large collections. Miss Adele Eigenmann, a medical student in Indiana University, returned in January, Mr. W. R. Allen traveling fellow of the University of Illinois, returned in April, and I returned the first of June.

Aside from the institutions mentioned the expedition had the cooperation of the American Association for the Advancement of Science, and the Bache Fund of the National Academy of Sciences.

Five weeks were lost in New Orleans waiting for passports. This delay made it inadvisable to attempt to cross the Andes at Cajamarca as planned and the expedition went directly to Callao. From Callao we went together over the Central Railway of Peru to Oroya. From Oroya Mr. Allen went to Lake Junin and down the valley of the Huallaga. Miss Eigenmann and myself first went south as far as Huancayo, later east to La Merced, at an elevation of 2,500 feet, then north to Cerro de Pasco and Gollalarsquisca, then to Casapalca, from where we examined various lakes, reaching an elevation of 15,900 feet. We then returned to the coast, went south by steamer to Mollendo, and by the Southern Railway over the crest of the Andes at Crucero Alto (nearly 14,000 feet) and north to Cuzco. Collections were made at Cuzco, in Lakes Lucre, Urcos, and Langilaio, Chinchero and Huaipo, and in the Urubamba, from its source at La Raya (13,370 feet) to Santa Ana, in the tropics at an elevation of 2,500 feet. We visited La Paz to secure concessions for Mr. Allen in Bolivia, and then we returned to Lima, at the end of 1918. Early in January we went by steamer north to Paita, from where Miss Adele returned home. I went inland from Paita to Piura, south to Pacasmayo and inland from Pacasmayo to Llallan. I returned to Lima at the end of January.

Mr. Allen, after some delay from fevers and other causes, returned from the Huallaga early in November to Lima, and then went direct to Lake Titicaca. He spent the time from December to May about Lake Titicaca. He went entirely around the lake, in part by rail, in part by boat, and in part afoot, collecting in many of the tributaries. He devoted particular attention to securing a set of the parasites of the fishes of Titicaca for the University of Illinois. It is hoped that the parasites will give some indication of the origin of the peculiar fishes so abundant in the high Andean lakes.

In February I went south to Chile, and collected in some of the rivers between Puerto Montt and the Rio Copiapo, which is the last of the rivers south of the Desert of Atacama. I also crossed from Puerto Varas, on Lake Llanquihue, to Lake Nahuel-Huapi, in the Argentine, collecting on the way in Lake Todos Santos and in Laguna Fria.

Large quantities of material were collected, and it will take many months to make a complete report. It is interesting to state that we secured four distinct faunas. The fish fauna of the region about Puerto Montt is highly tinctured with species belonging to families that are also found in Australia. These begin to decrease north of Valdivia. At Conception, aside from the lampreys, only one Australian type was found. The fauna about Santiago is quite different from that about Puerto Montt, and north of Santiago this fauna gradually dwindles. In the last river south of the desert, at Copiapo, only introduced gold fishes were found. It is probable that pejereyes and other fishes of marine origin are to be found about the mouth of this river. About Copiapo it rarely rains, but at Puerto Montt and Valdivia in the south the

[1] Mr. Will G. Irwin, of Columbus, Ind., made the expedition possible. See Science, August 2, 1918.

rainfall is very excessive. The faunas of western Ecuador and western Colombia are distinctly Amazonian in type and in northern Peru, at Piura, the fauna is Ecuadorian. The species decrease in number from north to south. The exact point where the northern Amazonian fauna disappears and the Chilean fauna begins has not been determined.

The Titicaca fauna is distinct and very interesting. No other lake of the same altitude has as many species; all of the species of the lake belong to two genera, *Orestias* and *Pygidium*. *Pygidium* is a genus of catfishes distributed over all the mountains of South America. The species found in Lake Titicaca is one of the largest of the genus and of some economic importance. The other genus, *Orestias,* is confined to the Andean lakes of Peru and Bolivia. There are a number of species in Lake Titicaca; some of them reach a foot, more or less, in length, and are brought to the markets about the lake. Others are minute, and sold in the markets in the neighborhood dried. *Orestias* is found northward at least to Cerro de Pasco, both in lakes and in stagnant portions of the rivers. It extends down the Urubamba valley to Ollantaitambo, and in the Oroya valley at least to Huancayo. It is essentially an Alpine genus, ranging from about 7,000 feet to over 15,000 feet in elevation. Considerable effort was made to get species from the lakes near Titicaca. Near Ticlio, the crest of the Central Railway of Peru, specimens were secured at an elevation of more than 15,000 feet.

The expedition had the heartiest cooperation of the authorities in both Chile and Peru. In Chile the government provided railway transportation. Professor Maldonado, of the Chilean government, will extend the examination of the Chilean rivers south of Puerto Montt. In Peru, Mr. Cesar Elguera, of the foreign office, took particular interest in the success of the expedition, and provided, through the government, the free entry of the equipment, and passes over the steamship lines between Paita and Mollendo. President Pardo of Peru furnished the expedition with orders to the prefects of Arequipa, Puno and of Cuzco to give us all facilities and they carried out the recommendations. The Prefect of Cuzco, Colonel Gonzales, took particular interest in the expedition, furnishing a sergeant as companion and interpreter between Quetchua and Spanish. Sergeant Medina carried orders from the prefect authorizing him to requisition anything needed by the expedition along its way and became an enthusiastic fisherman. Mr. Morquill, president of the Peruvian Company, gave the expedition passes over all the railways of Peru; and Mr. Blaisdell, manager of the Southern Railway of Peru, supplemented these by orders to the various officials along the line. The cooperation of Mr. Morquill and Mr. Blaisdell meant much more than the saving of railroad fares.

Of private individuals, Señor Duque, who entertained the expedition at Santa Ana, and Sr. Corazao, at Ollantaitambo, deserve first mention. Mr. Rawlins, Mr. Babbit, Mr. Murdock and Mr. Emerson, of the Cerro de Pasco Corporation, and Mr. Roper, of the Backus and Johnson Company, helped by supplying horses, living accommodations and beasts to explore the high lakes between Casapalca and Gollalarsquisca. Messrs. Bridge and Woodbridge, of the Transandean Railway of Chile, provided for a trip to the crest of the Andes in Chile. Mr. Roth helped in various ways on the trip between Puerto Varas and the Argentine, and many others helped in one way or another.

In conclusion, it must be mentioned that President Prado and Professor Rospigliosi, of the University of San Marcos, in addition to numerous courtesies have promised cooperation in other expeditions planned for the part of Peru east of the Andes.

The only item that hampered the expedition was the delay in the first instance in rendering a decision on passports. Passports were then refused. A direct appeal by Indiana University and the University of Illinois to President Wilson brought a commutation of the sentence rendered by the state department, on charges preferred by a person who in his modesty does not want to be made

known. Five weeks were lost at New Orleans and the trip from Cajamarca to the Marañon had to be omitted.

Carl H. Eigenmann
Indiana University

DR. ABRAHAM JACOBI (1830–1919)

Dr. Abraham Jacobi, the father and founder of American pediatrics, died at his summer home at Bolton Landing, N. Y., on July 10, at the age of eighty-nine years.

Dr. Jacobi was born of Jewish parents in the village of Hartum, Westphalia, on May 6, 1830. His people were not well-to-do, his education was accomplished through privation and struggle, but he early acquired a knowledge of Latin, and, after the usual courses of instruction in the village school and the Gymnasium at Minden, he went to the University of Greifswald, in 1847, at the age of seventeen, to matriculate as a student of Oriental languages. Becoming interested in medicine, he turned to anatomy and physiology. Following the peripatetic plan of the German student, he proceeded to Göttingen, where he came under Frerichs and Woehler, winding up his course at Bonn, where he graduated in 1851, with a Latin dissertation "Cogitationes de vita rerum naturalium," which has considerable philosophic depth. In the meantime, the Revolution of 1848 had broken out and run its course, and in this brief drive for liberty, Jacobi, with Ferdinand Freiligrath, Karl Marx, Carl Schurz and others, had been a leading spirit. When he went to Berlin, to take his state examination, he was apprehended by the Prussian authorities, imprisoned for a year and a half in a German fortress at Cologne, convicted of lèse majesté, and again held in detention for six months at Minden. In 1853, through the friendship of his jailer, he managed to escape, took ship at Hamburg, and after some vicissitudes in England and New England, settled down to practise at 20 Howard Street, New York. Here, beginning with such modest fees as 25 and 50 cents for office and house visits, five to ten dollars for obstetric cases, he soon managed to make a living. In the first year of his practise, he made $973.25. During the next year (1854), he invented a laryngoscope of his own, which was unfortunately not ever patented or made public before the appearance of Manuel Garcia's instrument (1855). By 1857, Jacobi was lecturing on pediatrics in the College of Physicians and Surgeons of New York. This was the starting point of clinical and scientific pediatrics in this country. In this branch of medicine, Jacobi had only one other American colleague (in no sense a rival or competitor), the devoted and unworldly J. Lewis Smith, whose famous treatise of 1869 passed through eight editions. In 1860, Jacobi was called to the first special chair of diseases of children in the New York Medical College; in 1861, Smith became clinical professor of pediatrics in the Bellevue Hospital College. In 1865, Jacobi took the clinical chair of his subject in the medical department of the University of New York. In 1870, he became clinical professor of pediatrics in the College of Physicians and Surgeons (1870–99). Officially, he taught pediatrics in New York for nearly half a century, actually, all his working life.

In 1862, Jacobi established a pediatric clinic in the New York Medical College Building in East 13th Street, which ran for two years. In this way, bedside teaching in pediatrics antedated bedside teaching in internal medicine in the United States.

Meanwhile, Jacobi had been an active and brilliant contributor to medical literature. In 1859, he published a volume of "Contributions to Midwifery and Diseases of Women and Children," with Emil Noeggerath,[1] who was to be Jacobi's coadjutor in founding the *American Journal of Obstetrics* (1862). During 1859–1903, Jacobi wrote much on diphtheria, and published successive treatises on diseases of the larynx (1859), dentition and its derangements (1862), infant diet (1872), diphtheria (1876), intestinal diseases of infancy and childhood (1887), diseases of the thymus gland (1889) and therapeutics of infancy and child-

[1] Author of the now well-established theory of the latency of gonorrhœa in unsuspected carriers (1872), which has been of great moment in the science of causation of pelvic disease in women.

hood (1896–1903). The tendency of these books is mainly practical, to spread the pediatric doctrine as applied science. The treatise on infantile therapeutics is, in reality, a treatise on pediatrics, summarizing the author's views and revealing his wide knowledge of the literature. To the medical periodicals, Jacobi contributed many papers, including his more original observations of infantile disease. His most enduring contributions to his science are perhaps the three monographs in the Gerhardt "Handbuch" on infant hygiene (1876), diphtheria (1877) and dysentery (1877). These, the products of a man approaching fifty, have all the force and fire of youth. To the history of pediatrics, Jacobi contributed the most important American papers, notably his St. Louis address (1904), two authoritative histories of American pediatrics (1902, 1913), a history of cerebrospinal meningitis in America (1905) and a history of pediatrics in New York City (1917). In sixty-six years of active practise he wrote an enormous number of miscellaneous papers of the most varied kind, most of which have been gathered in eight volumes ("Collectanea Jacobi," 1909). These include some of the wisest and wittiest discourses in medical literature. As a pendant to the festal volume presented to him on his seventieth birthday (1900), it had been proposed to commemorate his ninetieth birthday with another memorial volume containing a complete bibliography of his writings, to be followed by a selection of his best utterances, such as Camac has culled from the writings of Osler. No more fitting tribute to Jacobi's memory could now be made.

In 1873, Dr. Jacobi married Miss Mary C. Putnam, who was one of the first lady graduates in medicine (1870), and became herself a famous physician.

Dr. Jacobi was of short, slight but elastic frame, his whole person dominated by the large, splendid head, leonine, magisterial, with its crown of hair, the living embodiment of some great high-priest of knowledge of old. The earlier portraits betoken extraordinary vigor of mind and body, and even in his declining years, his cheerful tenacity of life was with him to the last. There came the inevitable lines in the face, "which years, and curious thought, and suffering give," but the expression of the wonderful eyes, subtle, humorous, pathetic, the eyes of the physician who is also philosopher, did not change. He was large-minded, big-hearted, intensely human, his conversation flavored with delightful banter, the tricksy humors of dainty Ariel or frolic Puck. With women and young people, in particular, his captivating charm of manner was unfailing. If it be true that "the old are natural enemies of the young," he was one of the delightful exceptions. With his broad background of culture, his knowledge and achievement, he had ever a delicate, ironic trait of genuine modesty, with which any reference to his own performance was inevitably tinctured, the modesty of those who, in the words of the Italian poet, "continually compare themselves, not with other men, but with their own ideal of perfection." In a private letter, he mourns "my constant routine work in daily practise for sixty years, that kept me in solitude, away from the good and great men, ever away from music and literature, and away from those who called me friend." His fidelity to duty was that of Browning's Corregidor. Yet he was a member, frequently president, of many medical societies, and a constant participant in their meetings. It is characteristic of the man that he once gravely rebuked me for disinclination to attend such meetings, although my excuse, as a non-practitioner, was perfectly valid. Characteristic also was his vein of thought, spontaneous as a flight of birds, with its omnipresent humor, a trait which made for perfect poise and sanity. His quaint remarks, at an alumni dinner, about the poultry in Lohengrin recall the well-known witticism of Lady Duckle in "Evelyn Innes." At the age of eighty-seven, he wrote:

> When old ladies believe in the efficacy of hot chamomile tea, no matter whether they mean Roman or vulgar flowers, in fever and in belly ache, you hope that not many of that class of old ladies are left. I have survived them.

As sometimes happens with those who have come to us "bringing gifts in their hands," Jacobi was, in helpful, unlifting citizenship, an inspiring example. He once said to me, very simply: "I am a Hebrew by race, but not clannish, not a sectarian." His adaptation to environment was, as in Osler's case, that of a colonial or continental American. In actuality, he belonged to the nobler ante-bellum generation which produced the "Lees, Lincolns, Shermans and Grants." The fact was written in his face. He had nothing either of the *vieux bonze* or of the smart, metallic, business manner of the *arriviste*. His civic courage was of the highest order. Not even the offer of Henoch's chair in Berlin could induce him to give up the ideals of his fiery youth, or to desert the country of his adoption, a sign that real character does not change: *Genio y figura, hasta la muerte.* One was frequently impressed with his facial likeness to the novelist Turgenieff, who, in a less personal and forthright way, was also a protagonist of civil and personal liberty, and in whom there was the same elusive irony and spontaneity of thought. One recalls the immortal words pronounced by Renan in the Gare du Nord over the bier of the great Russian, once defined as "the best that human nature is capable of":

> Il fût d'une race par sa manière de sentir et de peindre; il appartenait à l'humanité tout entière par une haute philosophie, envisageant d'un œil ferme les conditions de l'existence humaine et cherchant sans parti pris à savoir la realité. Cette philosophie aboutissait chez lui à la douceur, à la joie de vivre, à la pitié, chez les créatures, pour les victimes surtout. Cette pauvre humanité, souvent aveugle assurément, mais si souvent aussi trahie par ses chefs, il l'aimait ardemment. Il applaudissait à son effort spontané vers le bien et le vrai. . . . La politique de fer qui raille ceux que souffrent n'était pas la sienne. Aucune déception ne l'arrêtait. Comme l'univers, il eût recommencé mille fois l'œuvre manquée; il savait que la justice peut attendre.[2]

As a soldier of the common good, as one to whom thousands of mothers and children in his city owe so much, it needs but the slightest alteration of the poet's lines to define what Jacobi stood for:

> Duty divine and Thought with eyes of fire,
> Still following Righteousness with deep desire
> Shone sole and stern before him and above
> Sure stars and sole to steer by; but more sweet
> Shone lower the loveliest lamp for earthly feet—
> The light of little children, and their love.

F. H. Garrison
Army Medical Museum

[2] E. Renan, "Adieu à Tourguénieff," October 1, 1883.

SCIENTIFIC EVENTS

THE BRITISH SCIENTIFIC PRODUCTS EXHIBITION[1]

The second British Scientific Products Exhibition promoted by the British Science Guild was opened at the Central Hall, Westminster, on July 3, and it will remain accessible to the public until August 5. It will be remembered that the first exhibition was held in King's College last August, but owing to the arrangements of the college, due to demobilization, it was found impossible to hold the present exhibition there. Last year's exhibition was afterwards transferred to Manchester, and it proved eminently successful in carrying into the provinces a knowledge of the recent achievements of British science and industry.

This year's exhibition was declared opened by the Marquess of Crewe in the presence of a representative company of scientific and technical workers. In his opening address Lord Sydenham, who occupied the chair, referred at some length to the important part played by British science and industry in the victory which has so recently crowned the Allied efforts. We proved ourselves superior to the enemy in every technical art, and but for the splendid cooperation of the leaders of science and industry our Army would have fought in vain.

In declaring the exhibition opened the Marquess of Crewe emphasized the difference between the present exhibition and the one held at King's College last year. The latter took place at a time when the result of the war was

[1] From *Nature*.

still doubtful, although the tide of battle was flowing strongly in our favor. Necessarily, therefore, it gave precedence to industries engaged primarily in the service of war. The present exhibition, on the other hand, is meant to show the triumphs of British industry in the arts of peace, and to bring home to the general public the importance of the relationship between science and industry, and also between education and research.

In this connection Lord Crewe dwelt on the desirability of introducing definite industrial courses for university students in technology, such courses to be taken in vacations at suitable works connected with the particular study the student is undertaking. Such an arrangement has worked with great success in the United States. The institution of industrial fellowships for post-graduate students attached to one or other of the universities would also have an important influence in keeping industries in touch with modern scientific developments, and, in addition, provide the country with highly trained technologists. The Department of Scientific and Industrial Research is endeavoring to do something on these lines by urging the establishment of industrial manufacturing associations which will carry on research in some particular technical branch.

The exhibits themselves are almost bewildering in their comprehensiveness. Practically every phase of British industry is represented, the various exhibits being divided into the following eleven sections: Mechanical Science, Physics, Textiles, Electrical Appliances, Medicine and Surgery, Paper and Illustration, Agriculture, Chemistry, Aircraft, Fuels and Metallurgy.

THE BRITISH PARLIAMENT AND MEDICAL RESEARCH

THE "Dogs' Protection" Bill, which was introduced by Sir Frederick Banbury and was greatly altered on report at the instance of the government, came up for third reading in the House of Commons on June 27. The third reading was formally proposed by Sir F. Banbury.

According to the report in the *British Medical Journal* Sir Watson Cheyne asked the House to say that it declined to proceed further with the measure, which would impose an unnecessary and vexatious obstacle to medical research. While recognizing the value of the amendment carried by the government as an alternative to the bill itself, he held that it introduced a very great obstacle to research. The task of getting the additional certificate which was required as the bill now stood ought not to be imposed. Another reason why he objected to the bill was that it involved a very grave censure upon a large body of honorable men and on a great profession; for this censure there was no justification. The bill in its present form implied that cruelty was being practised, and that the medical profession delighted in torture and could not be trusted to deal with animals. At one time he had certificates and licenses, and later he became one of those responsible for signing certificates. At the time that he sought licenses he found it difficult to get the second signature, and when the certificates were obtained they had to be taken to the Home Office, and used to lie there for some considerable time before they were gone through. Under the bill it was proposed to have further restrictions and another certificate, which was to be got in order to show that no other animal was possible for the experiment except a dog. It would be necessary not only to persuade the informed people but also the Home Secretary, who perhaps knew little about this particular department of science, that the experiment was necessary. Thus a very great difficulty would be added to many existing difficulties, and delay would be caused. In maintaining that the fresh restrictions were unnecessary, Sir Watson urged that those in responsible positions as to these matters lived up to their responsibility. He had known the danger of delay, and had tried to make the decision the same day; but he had more than once refused certificates, either that he thought the research was not a good one, or because he thought the man seeking to undertake it had not had sufficient preliminary education for such important work. The suggestion of

the Antivivisection Society, that the duty of deciding as to the grant of certificates was not satisfactorily discharged, was disgraceful. Sir Watson next referred to the principle arguments raised against experiments on dogs. It was said that if there was anything of value to be learned it could be obtained by observations on patients and by *post-mortem* examination. As an illustration how wrong that opinion was, Sir Watson spoke of the situation which occurred when the Germans first used gas. Personally, he was much alarmed, for if the enemy had gas enough, it seemed to him they could easily destroy whole armies. How was that risk to be dealt with? Were the authorities to sit down and wait while the doctors watched gassed men and waited for a *post-mortem* examination? Had experiments on dogs not been made much valuable time would have been wasted and many lives would have been lost. But certain experiments on animals—dogs and goats—were made and complete protection was quickly found against the gas. The history of medicine was full of instances of prolonged observations of patients and of *post-mortem* examination, without result. Yet results had been achieved almost at once by experiments on animals. In conclusion, he urged that at a time when health bills had just been placed on the Statute Book the sensible thing to do would be to sweep away restrictions instead of imposing fresh ones.

Sir Philip Magnus, in seconding the amendment, said that by the rejection of this bill Parliament would show its appreciation of the efforts that had been made by scientific men through researches to prevent and cure diseases. The bill was inconclusive and contradictory. For example, it appeared, as he read the first clause of the bill, that if some eminent surgeon desired to perform an experiment on a dog, which would relieve it of great pain and possibly save its life, he could not perform this experiment, however urgent, without a certificate from the Home Office. After further discussion in favor of and against the bill, it was defeated by a vote of 101 to 62.

A BILL FOR A NATIONAL DEPARTMENT OF HEALTH

Honorable Joseph I. France, U. S. Senator from Maryland and chairman of the Senate Committee on Public Health and National Quarantine, introduced on July 17, Senate Bill 2,507 creating a department of public health. The bill follows the general plan of the Owen Bill, with some important modifications.

According to the summary in the *Journal* of the American Medical Association it provides for a department of public health under the direction of a secretary, who shall be a member of the cabinet, and for three assistant secretaries, the first assistant to be a man trained in medical science, public health and sanitation; the second to be an expert in vital statistics, and the third to be a woman trained in medicine or nursing and public health. The U. S. Public Health Service and the Bureau of Chemistry are to be transferred to the new department, which is also to have bureaus on vital statistics, sanitation, hospitals, child and school hygiene, quarantine, food and drugs, nursing, tuberculosis and personnel. The secretary of public health is directed to communicate with the governor of each state requesting him to recommend to the legislature suitable legislation with adequate appropriations to secure cooperation between the federal department of public health and the state board of health. Every state taking such action is to be entitled to its proportionate share of such funds as may be appropriated by Congress for carrying out the provisions of the act. The secretary of public health is also directed to divide the United States into health states, districts, subdivisions and precincts, each conforming to the geographical boundaries of the various political divisions. Each state is to create a state board of health with a state health officer and a health officer for each district, subdivision and precinct, the secretary of public health to appoint these state officers as federal health officers "so that in each cooperating state every health officer of said state or of each district, county or precinct therein is by virtue of his selection by the

local authorities become also a federalized officer and as such an integral part of the Department of Public Health." The Department of Public Health is directed to cooperate with the Departments of Commerce, Labor and the Interior in the collection of vital statistics and to establish a uniform system of cards, records and reports regarding diseases, disabilities, industrial accidents, births, deaths, physical condition of school children, the number and condition of existing hospitals, etc. The bill provides for the appropriation of $15,000,000 for 1920 to be prorated among the states in proportion to their population as soon as the states comply with the provisions of the law and the regulations of the secretary of public health, provided that each cooperating state must contribute to the public health work a sum equal to that contributed by the federal government and that it must make full and complete reports of births, deaths and morbidity. It also appropriates $48,000,000 for the construction of sanatoriums and hospitals, this sum to be distributed among the states in proportion to their population, each state receiving its allotment to provide an equal amount, also location, plans and means of future support for the proposed hospital.

THE ROCKEFELLER INSTITUTE OF MEDICAL RESEARCH

THE Board of Scientific Directors of The Rockefeller Institute for Medical Research announces the following promotions and appointments:

Dr. Harold L. Amoss, hitherto an associate in pathology and bacteriology, has been made an associate member.

Dr. Oswald T. Avery, hitherto an associate in medicine, has been made an associate member.

The following have been made assistants:

Miss Clara J. Lynch (pathology and bacteriology).
Dr. Waro Nakahara (pathology and bacteriology).

The following new appointments are announced:

Dr. Homer F. Swift, associate member in medicine.
Dr. Francis G. Blake, associate in medicine.
Dr. Raymond G. Hussey, associate in pathology and bacteriology.
Dr. J. Harold Austin, assistant in medicine and assistant resident physician.
Dr. Albert H. Ebeling, assistant in experimental surgery.
Dr. Ferdinand H. Haessler, assistant in pathology and bacteriology.
Dr. Thorsten Ingvaldsen, assistant in chemistry.
Dr. Charles W. Barrier, fellow in pathology and bacteriology.
Dr. J. Jay Keegan, fellow in pathology and bacteriology.
Dr. Philip D. MeMaster, fellow in pathology and bacteriology.

Dr. Alphonse R. Dochez, hitherto an associate member in medicine, has accepted an appointment as associate professor of medicine in the medical department of Johns Hopkins University.

Dr. Arthur L. Meyer, hitherto an associate in physiology and pharmacology, has accepted an appointment as associate in physiology in the school of hygiene and public health, Johns Hopkins University.

THE RAMSAY MEMORIAL

AT a meeting of subscribers of the Ramsay Memorial Fund held at University College, London, the committee submitted a report showing that £43,000 in cash was already in hand, and £70,000 was in view, so that £100,000 aimed at was within realization. The sum already collected is probably the largest which has ever been raised in honor of any man of science, however distinguished. Sir Hugh Bell explained the views of the committee with regard to the application of the money, and after hearing him the meeting agreed to the following resolution:

1. That a sum of £25,000 be definitely allotted to the senate of the University of London towards the provision of a laboratory of chemical engineering at University College, London, on the site proposed in close proximity to the existing engineering buildings.

2. That the executive committee be empowered to employ the balance of the fund already subscribed, and all future donations to be received, to the foundation of Ramsay Memorial Fellowships to the number of three or to such smaller number as they may deem expedi-

ent until the fund is sufficient for founding fellowships.

3. That if and when the amount of the fund exceeds the sum required for giving effect to resolutions (1) and (2) the division of such further sum between the augmentation of the sum allotted for the chemical engineering laboratory and the augmentation of the number of available fellowships be referred to the executive committee for decision.

SCIENTIFIC NOTES AND NEWS

Dr. John Campbell Merriam, professor of paleontology and historical geology in the University of California, who has been acting chairman of the National Council of Research, was elected president of the Pacific Division of the American Association for the Advancement of Science at the Pasadena meeting.

On the occasion of the seventieth birthday of Sir William Osler, regius professor at Oxford University and previously professor in the Johns Hopkins University, which occurred on July 12, he was presented by Sir Clifford Allbutt with a collection of essays contributed by about one hundred of his pupils and colleagues.

Dr. F. G. Cottrell, chief metallurgist of the Bureau of Mines, has been named assistant director in charge of all investigative and scientific work and J. E. Spurr, chief of investigative work in connection with relief claims has resigned to become editor of the *Engineering and Mining Journal* of New York.

At its recent commencement the University of Maine conferred the degree of LL.D. upon Dr. Raymond Pearl, of Johns Hopkins University.

Major William Bowie, chief of the Division of Geodesy, U. S. Coast and Geodetic Survey, received the degree of doctor of science at Trinity College, Hartford, Connecticut, on June 23. Major Bowie sailed from New York on July 5 to attend as a delegate from the United States Coast and Geodetic Survey, the conference of the International Research Council, which is being held at Brussels from July 18 to August 10.

Sir Francis Younghusband, known for his works on Asia and Africa, has been elected president of the Royal Geographical Society to succeed Sir Thomas Holdrich.

Mr. L. G. Radcliffe, of the Municipal College of Technology, Manchester, has been awarded the gold medal of the Worshipful Company of Dyers, London, for his researches on the sulphonation of fixed oils.

A Ramsay Memorial Fellowship has been awarded to Elrid G. Young, M.Sc., of McGill University. These fellowships are of the value of $1,500, and are given to the students for ability in research to enable them to continue their work in one of the British universities.

It is reported in *Nature* that in reply to a question in the House of Commons on July 8, it was stated that the appointment of Major C. E. Mendenhall, professor of physics in the University of Wisconsin, as scientific attaché to the United States Embassy has been notified to the Foreign Office by the United States Ambassador. No steps have as yet been taken to appoint a scientific attaché to Washington. The appointment of Professor Mendenhall was a war measure and it has yet to be decided whether the post will be made permanent.

Captain Ebson Y. Titus has been appointed assistant professor of chemistry at the University of Wisconsin. Captain Titus received his doctorate at Wisconsin in 1917. Shortly thereafter he entered military service and became gas officer of the Sixth Division in France. In November, 1918, he returned to the United States and was detailed to the Ordnance Department and was made chief chemist for Nitrate Plant No. 1 at Sheffield, Alabama.

Dr. Isaac F. Harris, head of the department of biochemistry of E. R. Squibb and Sons, has moved from the laboratories at New Brunswick, New Jersey, to the offices of this company in New York. During the last years of the war, Dr. Harris constructed and equipped a factory at New Brunswick for the manufacture of the chlorinated derivatives of toluol-chloramine-T and dichloramine-T, which were

so extensively employed as antiseptics by the allied forces, according to the methods of Drs. Alexis Carrel and H. D. Dakin.

DR. AUSTIN M. PATTERSON, who for the past fourteen months has been connected with the editorial section of the American University Experiment Station, Chemical Warfare Service, has returned to his home at Xenia, Ohio.

LIEUTENANT COLONEL JOHN AMYOT, professor of hygiene and preventive medicine in the University of Toronto, who has been overseas for three or four years as sanitary officer to one of the Canadian divisions, has been appointed deputy minister of the newly created federal department of public health at Ottawa.

PROFESSOR WOOLNOUGH has been granted five months' leave of absence by the senate of the Western Australian University to visit England and place the claims of the western state before Messrs. Brunner, Mond, and Co., as the most suitable site in Australia upon which to establish the alkali industry.

DR. S. BURT WOLBACH, of Harvard University, who has been in Mexico to make certain studies on typhus fever, has returned to the United States.

T. D. BECKWITH, professor of bacteriology at the Oregon Agricultural College, has been granted a leave of absence for one year. He expects to study at the University of California.

DR. EDWARD COWLES, a distinguished chemist, long superintendent of the McLean Hospital and professor of mental diseases in the Dartmouth Medical School, died at Plymouth, on June 25, in his eighty-third year.

ADRIAN J. BROWN, professor of the fermentation industries at the University of Birmingham, known for his contributions to biological chemistry especially in its applications to brewing, died on July 2, at the age of sixty-six years.

SIR WILLIAM MCGREGOR, a well known English colonial governor, who made important contributions to ethnology when stationed at New Guinea, has died at the age of seventy-two years.

DR. NIKOLAS BEREND, a member of the faculty of the University of Budapest and widely known as an authority on children's diseases, was killed recently during an attempt to overthrow the Soviet government in Budapest.

THE first National Congress of the Manufacturing Chemists of Italy is to convene at Milan in October with an exhibition annex.

THE London *Times* states that members of the International Hydrographic Conference visited the Admiralty Compass Department at Ditton Park, Datchet, where all work connected with the receipt, issue and testing, etc., of compasses, both magnetic and gyroscopic, for the Navy and Air Force is carried out at the Observatory, and branches have recently been formed for experiments and research work on compasses and optical instruments. The guests were received by Captain Creagh Osborne, director of the observatory, and after luncheon split up into parties and members of the staff explained the instruments and their utility. During the war as many as 1,500 aeroplane compasses have been turned out in a week at the observatory, and at times as many as 7,000 have been received from oversea and from the country for repair.

Nature states that having held its meetings at Taunton during the period of the war, the Somersetshire Archeological and Natural History Society had hoped to hold its seventy-first annual meeting and excursions away from headquarters, but this has been found impossible owing to the difficulty of hotel accommodation. However, long excursions will be taken into Devon on this occasion, viz., to Hembury Fort, Cadhay House (1545–87), and Ottery St. Mary Church on July 30, and to Exeter on July 31. The annual meeting will be held at Taunton on July 29 under the presidency of Mr. Henry Balfour, curator of the Pitt Rivers Museum at Oxford, and past-president of the Royal Anthropological Institute. The subject of his presidential address was "The doctrines of General Pitt Rivers and their influence." The society now consists of between 900 and 1,000 members, and owns a

large library and the Somerset County Museum at Taunton Castle.

The psychological laboratory of the Johns Hopkins University has been granted the sum of $6,000 "for investigating the informational and educative effect upon the public of certain motion picture films used in various campaigns for the control, repression and elimination of venereal disease."

To increase its capacity for the production of anti-pneumonia serum, the laboratory in charge of Dr. Preston Kyes, professor of preventive medicine at the University of Chicago, is to be enlarged at a cost of five thousand dollars.

Through the generosity of Colonel Walter Scott, of New York, the library of the department of zoology at Smith College has received a complete set of the great Belgium entomological work Wytsman's "Genera Insectorum."

Dr. William Allen Sturge bequeathed his large collection of prehistoric objects of stone, bone and horn to the British Museum.

Nature states that it is proposed to establish an institute of commercial and industrial psychology and physiology. The announcement is accompanied by a summary of thirty investigations in which the scientific analysis of industrial movements resulted in a notable improvement of output, and reference is also made to the effects of shorter hours and the introduction of rest pauses. Amongst the scientific supporters of the proposals are Sir Walter Fletcher, Mr. W. B. Hardy, Lieutenant Colonel Myers, Professor C. S. Sherrington and Professor E. H. Starling. The secretary is Mr. G. Spiller, 1 Great Tower Street, E.C.3.

The Geological Survey, of Ottawa, Canada, has sent an expedition to Graham Island, of the Queen Charlotte group in British Columbia, off the west coast of Canada. Mr. Clyde L. Patch is studying and collecting mammals and birds and is giving special attention to the herpetology of the regions. Mr. Harlan I. Smith is continuing his researches into the archeology of the North Pacific coast of America which he began in 1897 on the Jesup North Pacific expedition by exploration and excavation in this part of the Haida linguistic area. The Haida were undoubtedly the most noted people and most feared warriors of the Pacific coast of North America. They were unsurpassed as canoe builders, carvers and painters. They were noted for their great potlatches and other financial and social customs. Yet the archeology of the Haida area is practically unknown, no intensive exploration or excavation of prehistoric sites having been made in their historic habitat.

"To stimulate interest, promote study and facilitate publication of researches in agricultural history" is the object of the Agricultural History Society which has been organized in Washington. It plans to present in permanent form the history of one of the biggest constructive factors in the history of the United States —agriculture—and the influence it has exercised in making this country what it is. The officers are: *President*—Dr. Rodney H. True, Bureau of Plant Industry, Washington, D. C.; *Vice-president*—Professor Wm. J. Trimble, Agricultural College, North Dakota; *Secretary-treasurer*—Lyman Carrier, Bureau of Plant Industry, Washington, D. C.; *Members of Executive Committee*—Professor R. W. Kelsey, Haverford, Pa., and O. C. Stine, Office of Farm Management, Washington, D. C. Interested persons who pay the dues of one dollar a year are eligible to membership.

A large herd of American buffalo has been purchased by William Clayton, of Wyoming, from W. D. Turner, of Colorado. The herd contains about 225 animals and sold for approximately $40,000. It is the intention of the purchaser to dispose of the buffalo in small groups to public parks and zoological gardens. The herd was started by General Palmer of Colorado Springs, Colorado, who desired to preserve a representative collection of the animals. Mr. Turner later secured the original herd and improved it by introducing new blood from Canadian herds.

The annual report of the Lister Institute of Preventive Medicine (the name is to be changed to the Lister Institute of Medical Re-

search), was recently issued. The London *Times* states that the institute at the outbreak of war emphasized to the War Office the paramount need of tetanus antitoxin, and on its own initiative took steps immediately to enlarge the capacities of its therapeutic farm at Elstree, where horses were kept for the purpose of producing the antitoxin. In consequence the needs of the soldiers were met and thousands of lives saved. The institute also carried out researches on the antitoxin, and on various other sera and antitoxins. The Trench Fever Committee, of which Sir David Bruce is chairman, owed very much to the help of the institute and, indeed, could not have carried its researches to their brilliant conclusion without that help. Investigations arising out of the outbreak of food poisoning in the Army in France were also carried on, and various other work in connection with food undertaken, more especially that dealing with what are called "accessory food factors." Scurvy, for example, which was one of the great problems among troops in Mesopotamia, arose from the absence of one of these factors in the ration. The researches of the institute enabled the fact to be established, and suggested the remedy. Causes and remedies similar in kind, though differing in particulars, have been investigated for infantile scurvy. Other researches are now proceeding in respect of the indispensable food factors in milk, butter, margarine and so on.

UNIVERSITY AND EDUCATIONAL NEWS

BY the will of Charles N. Clark, former treasurer and trustee of Smith College, practically his entire estate, estimated at $500,000, is bequeathed to Smith and Mount Holyoke colleges.

AT the University of Michigan salaries have recently been increased 30 per cent. for instructors and assistant professors and 25 per cent. for associate professors and full professors. The new scale of salaries is from $1,300 to $2,100 for instructors, $2,200 to $2,600 for assistant professors, from $2,700 to $3,100 for associate professors and from $3,200 to $6,000 for full professors. The same scale applies to all colleges.

A COMPETITIVE examination to fill four vacancies in the grade of instructor in mathematics will be held at the Naval Academy, Annapolis, Maryland, on August 27. The base pay is $2,000. Particulars as to the qualifications can be obtained from the head of the department.

DR. H. A. MORGAN, dean of the Tennessee State College of Agriculture, has been elected president of the University of Tennessee.

DR. JOHN C. HESSLER, professor of chemistry, has been appointed acting president of the James Millikan University at Decatur, Illinois.

DR. ROLLIN D. SALISBURY, professor of geographic geology and head of the department of geography at the University of Chicago, has been appointed head of the department of geology and paleontology to succeed Professor Thomas C. Chamberlin, who has retired from active service. Professor Harlan H. Barrows has been given the chairmanship of the department of geography made vacant by the transfer of Professor Salisbury. The latter still remains dean of the Ogden Graduate School of Science. Dr. Edson Sunderland Bastin, of the United States Geological Survey, has been appointed to a professorship of economic geology, from January 1, 1920. Dr. Bastin received his doctor's degree from the University of Chicago in 1909. Other new appointments are those of Russell Stafford Knappen to an instructorship in geology, and of Derwent Stainthorpe Whittlesey to an instructorship in geography.

DR. RICHARD WRENSHALL, a graduate of Yale University, has joined the faculty of the College of Hawaii, as professor of chemistry.

THE following appointments have been made at the University of Birmingham: John Robertson as professor of hygiene and public health; John Shaw Dunn as professor of pathology; Leonard Gamgee as professor of surgery; B. T. Rose, demonstrator of anatomy, and Miss Hilda Walker, lecturer in physiology.

DISCUSSION AND CORRESPONDENCE

LABORATORY INSTRUCTION IN CHEMISTRY; ITS AIMS AND ITS LIMITATIONS

It is now well over half a century since the laboratory has been regarded as a necessary feature in the study of science—elementary as well as advanced. Before that laboratory methods of instruction were rarely practised and were available only for the exceptionally fortunate, or probably exceptionally able, student who had first demonstrated in a purely intellectual way his aptitude for science.

The greatness of the achievement of the brilliant scientific men before, say the middle of the nineteenth century, with poor facilities for work, and inadequate knowledge upon which to build, certainly furnishes an argument that intellect may be stimulated rather than discouraged by lack of practical facilities.

The question must present itself to every one connected with training students in scientific schools, to what extent expensive laboratory facilities are justified, particularly for the great numbers of elementary students, when compared with the results achieved. No one will argue that direct observation of scientific phenomena in experiments performed with the student's own hands does not increase the student's familiarity with the phenomena. Perhaps we might say that the impression made upon the student's mind by a personally performed experiment is so much more vivid than the impression made by a written statement in a text-book, or even by an experiment performed by the professor on the lecture table, that the phenomenon is remembered with much less intellectual effort. Since however progress is attained only through the expenditure of effort, we may well ask, will the student of science reach as high a plane of intellectual development if the laboratory is used too freely for demonstration purposes.

The writer acknowledges as the immediate stimulus to present these thoughts, the article in Science of May 30, 1919 (page 506) upon "The Freas System," written by Dr. W. L. Estabrooke.

The Freas System is obviously a recognition of the problem of balancing the costs of laboratory instruction against the results. It is to be hoped that further details of this system promised by the writer will bring its advantages fully to the knowledge of those who have the administration of the laboratories of our schools and colleges. Certain rather broad aspects of the question are suggested by the first article and it is to be hoped that they will be discussed by the advocate of the Freas System.

The Freas System seems to be a species of modern factory efficiency management applied to laboratory administration. There can be no doubt that all possible efficiency in obtaining, distributing and conserving laboratory supplies and apparatus is to be desired, nor is there any doubt that without careful planning and a capable administrator in charge the efficiency will be low. But how far will the enthusiasm for efficiency in handling supplies tend to reduce the instruction to a lifeless routine. It would almost seem as if in the Freas plan the structure of the laboratory course had been built around the framework of the system of supply distribution. For we are told that at the beginning of a term the student receives supplies exactly sufficient for a whole term's work in a carefully planned kit. Such a kit contains for some of the courses as many as 140 different bottles of materials.

Modern American factory methods are marvelous when measured by the material output, but they do not rank so high when measured in terms of the welfare of the individual worker. Perhaps the solution of the factory-labor problem will recognize that the welfare and happiness of the individual workers is the framework around which the structure of industry must be built. No educator thinks other than that intellectual development is the aim to which educational effort must be directed. The writer does not see how a standardized routine of laboratory experiments can stimulate the intellectual development of a student any more than the intensive drive of production in a textile mill can stimulate the joy of life in the worker standing day after day in the same place over noisy looms.

The primary purpose of the experimental laboratory was to carry out original investigations. It is well not to lose sight of the fact that the laboratory of elementary chemistry can appear to the beginning student a place of original investigation. Indeed it is probably safe to say that the amount of intellectual stimulus he receives in the laboratory is in direct proportion to the extent to which he takes the attitude of an investigator.

It is more often the case than not that after a student has performed a routine experiment in a routine manner, he will retain of it so vague a recollection that he will be unable to relate his observations the next day in the class room. When however the experiment has developed some unexpected feature which perplexes him enough to incite him to try out variations of the experiment upon his own initiative, he will be found full of information and argument in the class room.

Elementary experiments may be classified into two kinds: (1) isolated short experiments, and (2) sustained experiments. The short experiments may be planned in a beautiful sequence, each building on the results of the preceding ones in a manner to arouse the admiration of an instructor. Yet to the student they seem just isolated experiments and he is only too likely to receive the impression that the standard of his work is measured by the number performed. Even when the student is above the average of intelligence and sees pretty clearly the sequence as planned by the instructor, he still does not develop very much enthusiasm for a thing which has been all planned out for him.

(2) The type of experiment referred to as sustained is illustrated by the "unknowns" of qualitative analysis, and by chemical preparations. In each of these cases there is a definite objective set to work toward, the work is prolonged enough to awake a sustained interest, and there is a tangible result obtained when the experiment is finished. Moreover, the manipulations require judgment and develop incidental problems not foreseen in the directions.

The writer believes that efficiency methods which increase the output of material products of an industry are not directly applicable to the development of intelligence. True, the Freas method may double the number of experiments which the student will perform in a laboratory period. But can we measure the development of the student by the number of experiments performed any more than we can measure the happiness of the mill operative by the number of yards of fabric which he can get through his looms in a day.

Scientific research is in its nature inefficient if judged in terms of the formulas of production experts. Yet research is recognized by large industries as a vital part of their organization.

The value of laboratory work depends mostly on the extent to which the students feel the research spirit—even if in but a very feeble way in elementary laboratories. The acquiring of manipulative skill and the learning of properties which are better stated in the textbooks than they can be observed by the student, are for the most part incidental to the more important purposes. To encourage this spirit of research, reagents must be available on the side shelves for free use within reasonable bounds. In fact a well-stocked outfit of reagent shelves serves as a chemical museum and time spent in going to these shelves, inspecting the chemicals there, and sometimes in trying out reactions not specified in the directions, is surely not time wasted. Naturally the student should be expected to work industriously during laboratory time and he should perhaps be expected to perform at least a certain minimum number of "required" experiments. But he should not be continually driven to realize the highest value of the ratio of experiments done to length of laboratory period. He should rather be distinctly encouraged to work thoughtfully and be made to feel that quality is given more recognition than mere quantity.

At all events there must be a compromise in elementary laboratories handling large classes, between efficiency of the supply service on the one hand, and the scientific inspiration to the

individual student on the other hand. It is hard to see how cut and dried laboratory experiments, with all materials measured out in advance ready to be put together, can interest an intelligent student so much as experiments performed on the lecture table.

The writer realizes that many will deem him guilty of heresy even for putting the question: Do we give too much laboratory work in our science courses? If it becomes necessary on account of expense to so standardize the laboratory work that it loses nearly all its stimulus, were it not better to omit laboratory from the program until at least the point is reached where experiments described earlier as of the sustained type apply?

Some students are at school or college for a general liberal education—not to specialize in science. How shall they be treated if they elect to study the elements of chemistry? Is the expense of even a standardized and denatured laboratory course justified? When chemistry is chosen mainly for the object of intellectual development does not the class room work without the laboratory serve the purpose? Indeed does it not require a higher order of intelligence to visualize a chemical phenomenon from a text-book statement alone, than from a laboratory demonstration?

The writer has ventured to raise questions in the foregoing some of which have an obvious answer, others of which have been viewed for more than a generation in a uniform dogmatic manner, but ought now to be reopened and reconsidered on their real merits. The Freas System involves these questions, and it constitutes a compromise between two unreconcilable conditions. So far as the evidence presented in the article referred to goes, it seems like the case in which the compromise was effected by one party acceding to all the demands of the other. However, a misconception may have been gained from the first article of the series and the other numbers should be awaited with interest.

Furthermore, if an issue seems capable of adjustment only through an unsatisfactory compromise, is it not the part of wisdom to reexamine the conditions underlying the issue to see if perhaps the issue itself ought not be reconstructed in such a manner as to avoid the necessity of a compromise.

Arthur A. Blanchard
Massachusetts Institute of Technology

METEOROLOGY AND THE TRANS-ATLANTIC FLIGHT

Within the past few months many millions of people have had their attention directed, as never before, to the importance of meteorological conditions in connection with the question of trans-Atlantic flight. A popular interest has thus been aroused which has been but partially satisfied by the often contradictory and usually rather meager information supplied by the daily newspapers. Many persons doubtless have a real desire to inform themselves more fully in regard to the weather conditions which are likely to be met with at various altitudes over the North Atlantic Ocean. A recent paper on "Trans-Atlantic Flight from the Meteorologists' Point of View"[1] brings together, in compact form, just the sort of information of which the intelligent public is in search. The author, Willis R. Gregg, of the Weather Bureau, was actively concerned as a meteorological expert in connection with the flight of the U. S. Navy planes. The fact that Mr. Gregg's article was in print before the recent trans-Atlantic flights were accomplished does not in any way detract from its interest or value.

Mr. Gregg's chief conclusions are as follows: Favorable conditions of wind and weather are necessary for the safety of airplanes which attempt the trans-Atlantic flight. In order to obtain the requisite knowledge of the prevailing atmospheric conditions, frequent and widely-distributed observations are necessary. When a favorable day comes, the meteorological expert can indicate the successive directions toward which the airplane should be headed in order to keep to any desired course, and can also calculate the assistance which the winds will furnish. Favorable conditions for an eastward crossing are found at 500–1,000

[1] *Mo. Wea. Rev.*, Vol. 47, 1919, pp. 65–75.

meters during about one third of the time. The percentage of favorable days increases materially at greater altitudes, especially along the northern route. The percentage of favorable days for the westward trip "is so small as to make trans-Atlantic flight in this direction impracticable until the cruising radius of aircraft is increased to such an extent that they are relatively independent of weather conditions."

As to the season, there is little choice. The prevailing westerly winds are stronger in winter than in summer, but there are more storms in the colder months. The greater prevalence of fog in summer is a disadvantage at that season which about offsets the greater amount of cloudiness in winter. The fogs of Newfoundland are generally of but slight vertical extent, and as they do not extend far inland they ought not to interfere with a landing if such is attempted some distance from the coast. The most important thing of all is the need of a comprehensive campaign to secure meteorological and aerological observations over the North Atlantic.

R. DEC. WARD

QUOTATIONS

BRITISH SCIENCE AND INDUSTRY

THE speakers at the opening of the British Scientific Products Exhibition emphasized different aspects of the same truths. When the war came, England was deprived of many scientific products which she had been content to receive from Germany. English scientific men and inventors had long been in the forefront of discovery, but English manufacturers had taken little advantage of their achievements. We had not the industrial processes for making high explosives from coal-tar nor the methods of making optical glass for gun-sights. In a thousand ways, great and small, we were unready for the ordeal. The unlimited valor of our fighting men and the unswerving resolution of the people alone carried us over the dead point. The exhibition of British scientific products, made in Britain, for the first time during the war, shows the splendid progeny of the *liaison de convenance* hurriedly arranged between science and industry. It is to be hoped that it will lead to a more permanent union.

The war is over, and there is more than a fear that the soporific effect of the cry "Business as usual" may again be felt. Business will not be as usual. The old British way of being content with large-scale manufacture of the "good enough," of seeking the easy market and the repeat order, is gone for ever. Even the best is not good enough, for there is always a better. As Lord Moulton said, Divine discontent must have its place in our industries. The manufacturer must keep in touch with the inventor and the scientific student. The men of the laboratory must keep aware of the industrial processes to which they can so largely contribute. The seller of British goods must have a better weapon than blandishment; he must be able to explain why his goods are the best, and to stimulate the imagination of his customers by the assurance of better. Lord Crewe rightly laid stress on the part of education in the new orientation of our scientific and industrial effort. He referred with legitimate pride to the associations of manufacturers and investigators that are being organized by the Council of Scientific and Industrial Research. But there is still a long way to go. In one sense, the lean years that lie ahead of us are less favorable to continued effort, although they require it even more urgently. During the war an imperative stimulus quickened our common purpose. Money flowed like water for the experiments of the laboratory and the workshop, and the operations of war supplied the swiftest and surest test of efficiency. We must lose none of the organizing and self-sacrificing spirit that we gained when our need seemed greatest.—The London *Times*.

SCIENTIFIC BOOKS

The Turtles of New England. By HAROLD L. BABCOCK, M.D. Mem. Boston Soc. Natural History, VIIII., No. 3, 4to, pp. 325 to 431, plates 17 to 32, April, 1919.

This is the most recent of the series of monographs of small groups of vertebrate animals issued by the Boston Society of Natural History from time to time. The seventeen species of turtles recorded as native to New England are taken up in order and described, size, color, form, distribution, numbers, breeding, food, enemies, economic importance. The plates comprise careful color drawings by R. Decker and J. Henry Blake, of all but the marine leather-back, loggerhead and green turtles, and photographs of these three. The illustrations facilitate the identification of the different turtles, supply the best existing figures of certain comparatively little-known species and, as representative of New England material, will be valuable for reference to faunal herpetologists. There are several pages of bibliography of references cited. Of the seventeen species of turtles treated, four are marine, one littoral, one almost strictly terrestrial, one strictly aquatic, and ten more or less amphibious. Exclusive of the marine species, six are rare or local in New England, the remaining seven being the snapping turtle, musk turtle, painted turtle, diamond-backed terrapin, spotted turtle, wood tortoise and box tortoise.

This publication will be welcomed by the students of the fauna of New England and herpetologists in general, but it should have a much wider circulation. Ability to refer to it will add to the pleasure which every New England child may be expected to find in turtles. The turtle is one of the most striking of nature's phenomena and the correlation of its remarkable structure with its habits has much popular interest. A careful consideration of the life-histories of the different species is a feature of Dr. Babcock's work. From the quotations it is noticeable how many interesting things about turtles have only recently come to light and we are impressed with the probability that others as interesting remain to be found out.

In conclusion, a word should be said of the thorough investigation of the New England fauna by the Boston Society of Natural History of which this paper is a detail. Larger institutions are often absorbed by distant problems and work of this nature is much needed to keep the study of natural history well balanced.

J. T. Nichols
American Museum of Natural History

SPECIAL ARTICLES

THE FUNGUS PARASITE OF THE PERIODICAL CICADA

The fungus *Massospora cicadina*, Peck has been extremely prevalent about Washington, D. C., during the recent reappearance of Brood X of *Cicada septendecim*. It was first collected in the conidial stage of development on May 31, or about ten days after the first emergence of the insect in this locality. Until June 7, however, it was not abundant, it being possible to collect only a dozen or so infected cicadas in an afternoon, and during this period only the conidial stage of the fungus was found. On June 10, however, following a wet period of a few days, the organism appeared in the resting spore condition and since this date has become increasingly prevalent until, at the present time, from five to nine out of every ten live adult males collected will show the resting spores of the fungus in some stage of development. On the other hand, infected insects showing conidia are rarely found now.

It appears from the observations made thus far that conidia and resting spores of *Massospora cicadina* are not formed simultaneously in the same insect, and infected individuals bearing only conidia of the fungus present a somewhat different gross appearance from those insects in which resting spores exclusively are produced.

In the conidial stage of development the fungus is usually exposed to view, due to the sloughing off of several of the posterior abdominal segments of the host's body, as a white or pale cream colored more or less coherent mass which is found to arise in the male hosts at least from a cushion-like substratum, the latter forming a more or less complete septum extending across the entire

body cavity. Anterior to this septum the abdominal cavity is entirely empty.

In the resting spore condition the fungus mass, in the males, in the early stages at least, likewise confined to the posterior portion of the abdomen, is at first white, then sulphur yellow and finally greenish brown or brown in color, and only slightly coherent. While the fungus in this stage of development seems likewise to be confined to the genitalia of the host, there is apparently no septum formed, and at maturity the resting spores, scatter about the entire body cavity. The resting spores, which are extremely uniform in size, are remarkably ornamented and at maturity form a dustlike mass which is freed from the insect by the disintegration of the intersegmental membranes of the abdomen.

In the few infected females that the writer has examined the fungus mass fills nearly the entire body cavity.

As noted by previous writers, many infected cicadas were found still alive and actively flying about with but a portion of the abdomen remaining, the entire posterior portion having sloughed off leaving the conidia or resting spores of the fungus exposed in such a way that every movement of the host served to scatter them.

It is hoped that a full account of the life history of this fungus will be published soon.

A. T. SPEARE

BUREAU OF ENTOMOLOGY,
WASHINGTON, D. C.

THE OHIO ACADEMY OF SCIENCE

THE twenty-ninth annual meeting of the Ohio Academy of Science was held at Ohio State University, Columbus, May 29 to 31, 1919, under the presidency of Professor Maynard M. Metcalf. Seventy-nine members were registered as present; forty new members were elected.

The academy formally recognized the establishment of a new section for Psychology, with an initial membership of about twenty.

It was reported by the trustees of the Research Fund that Mr. Emerson McMillin, of New York City, had made a further contribution of two hundred and fifty dollars in support of research work by the academy.

At the close of the formal session, the geologists, under the leadership of Professors J. E. Hyde and T. M. Hills, made an excursion to Newark for the study of glacial physiography and the Upper Waverly formation, while Professor W. M. Barrows conducted a zoological and botanical excursion to Sugar Grove.

Officers were elected as follows: *President*, F. C. Blake, Ohio State University; *Vice-presidents: Zoology*, F. H. Herrick, Western Reserve University; *Botany*, A. B. Plowman, Municipal University of Akron; *Geology*, J. E. Hyde, Western Reserve University; *Physics*, M. E. Graber, Heidelberg University; *Medical Sciences*, R. J. Seymour, Ohio State University; *Psychology*, G. R. Wells, Ohio Wesleyan University; *Secretary*, E. L. Rice, Ohio Wesleyan University; *Treasurer*, W. J. Kostir, Ohio State University.

The scientific program was as follows:

PRESIDENTIAL ADDRESS

The scientific spirit: PROFESSOR MAYNARD M. METCALF, printed in SCIENCE for June 13, 1919.

PUBLIC LECTURE

Airplanes, present and future: MR. DAVID CARROLL CHURCHILL, Oberlin.

PAPERS

The theory of chance applied to the Bacon-Shakespeare controversy: T. C. MENDENHALL.

Teleology in the teaching of zoology: W. M. BARROWS.

Dynamics and evolution as illustrated in the euglenoids: L. B. WALTON.

Notes on a technique for the study of Euglenidæ: W. J. KOSTIR.

The comparative resistance of different species of Euglenidæ to acids: W. J. KOSTIR.

Notes on a tingid destructive to beans: HERBERT OSBORN.

The European corn borer (Pyrausta nubilalis Hubn) a menace to American agriculture: E. C. COTTON.

The stratification of spiders in meadows: W. M. BARROWS.

Concerning the attachment of larval colonies of Pectinatella and Plumatella: STEPHEN R. WILLIAMS.

Remarks on the phylum Prosopygia: RAYMOND C. OSBURN.

The bryozoan fauna of Greenland: RAYMOND C. OSBURN.

Classification of the Salpidæ: MAYNARD M. METCALF.

The remarkable fauna of a drop of pond water: W. J. KOSTIR.

Polymorphism and allelomorphism in Bruchus quadrimaculatus: J. K. BREITENBECHER.

Circulation of cœlomic fluid in a nematode: F. H. KRECKER.

Egg laying of a leech, Piscicola: F. H. KRECKER.

The columella auris of the reptiles: EDWARD L. RICE.

Information wanted in zoological and botanical cases to be cited: Katharine D. Sharp.
Use of airplane in studying vegetation: Paul B. Sears.
A map of Ohio prairies: P. B. Sears.
Brief notes on some Ohio plants: L. S. Hopkins.
A remarkable bud sport of Pandanus: John H. Schaffner.
The nature of dieciousness in the hemp: John H. Schaffner.
Xenia in maize and rye: A. E. Waller.
Some biological relations of the Hysteriales: Bruce Fink.
A hitherto undescribed ascomycete: Freda Detmers.
Witches broom of bald cypress: Freda Detmers.
Abscission of Populus deltoides (common cottonwood): Lois Lampe, introduced by Freda Detmers.
Toxic and antagonistic effects of salts on yeast (Saccharomyces ellipsoideus): Swarna K. Mitra, introduced by E. N. Transeau.
Two serious diseases of wheat new to America: W. G. Stover.
Estimates on the thickness of the sedimentary rocks of Ohio: T. M. Hills.
Some geological features in the Akron region: G. F. Lamb.
Some future industrial centers in America as seen by a geographer: Geo. D. Hubbard.
The location of the barrier between the Ohio and Mississippi Valley basins in Richmond times: August Foerste.
Some aspects of the Waverly: J. E. Hyde.
The pyrite deposits in the Ohio coals: W. M. Tucker.
The correlation of Ohio Silurian strata with those of Indiana: August Foerste.
Elongation of nickel in transverse magnetic fields: H. A. Bender.
The prevention and treatment of pneumonia: E. F. McCampbell.
Recent advances in the auditory method of measuring blood pressure: Clyde Brooks.
Vaccines and serums in coccus infections: C. B. Morrey.
Five years of progress in medical entomology: Edna Mosher.
A note on the technic of smear preparations: F. L. Landacre.
Differentiation of mucous and serous cells: Eva Campbell, introduced by F. L. Landacre.
Note on the effect of dry heat upon the blood of Guinea pigs: Jonathan Forman.
Observations upon the complement content of the blood of guinea pigs which have been subjected to dry heat: Carl H. Spohr.
Observations on the death of guinea pigs induced by dry heat: Ernest Scott.
A model illustrating some features of urinary secretion: Martin H. Fischer.
The muscle-twitch curve: E. P. Durrant.
Vitamine tests with chicks: R. J. Seymour and E. P. Durrant.
An anomalous frog heart: E. P. Durrant.
A modified Waterhouse test for pure butter: Chas. P. Fox.
Demonstration of Mendel's law: W. M. Barrows.
Observations on the diagnosis of contagious abortion by guinea pig inoculation: W. A. Starin.
Fat absorption in earthworm, salamander and frog: Chas. G. Rogers.
The nature of the lyophilic colloids and their importance in theoretical and applied science: Martin H. Fischer.
The normality vs. the psychopathy of the precocious child: Florence Mateer.
The clinical function of psychology: Florence Mateer.
Short methods of individual examination used by psychologists in the army: James W. Bridges.
Psychological study of a delinquent: Louise Wood.
The very bright child: C. Thompson Jones.
The moral and religious psychology of late senescence: T. Bruce Birch.
Psychology applied to the problems of everyday life: A. W. Trettien.
The vocality of fork, violin and piano tones: Esther Gatewood.
Relations of images in recall to directly aroused sensations: A. Sophie Rogers.

DEMONSTRATIONS

A case of apparent triple superfetation in the cat: R. A. Budington.
Growths on glass slides submerged in open sea water ten days: R. A. Budington.
Exhibit of Ohio Cicadellidæ: Herbert Osborn.
Indications of circulation of cœlomic fluid shown by preserved nematodes: F. H. Krecker.
Model of nasal region of the lizard, Eumeces: Elva Pumphrey, introduced by Edward L. Rice.
Sections of columella auris of the lizard, Eumeces: Edward L. Rice.
A hitherto undescribed ascomycete: Freda Detmers.
Auditory method of measuring blood pressure: Clyde Brooks.
Technic of smear preparations: F. L. Landacre.
Model illustrating some features of urinary secretion: Martin H. Fischer.
A new muscle lever: E. P. Durrant.
An adjustable spring-myograph: E. P. Durrant.
An anomalous frog heart: E. P. Durrant.

Edward L. Rice
Secretary

Delaware, Ohio

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